PART IV

GEOGRAPHY OF PACIFIC COUNTY

Topography

Pacific County lies within the two physiographic sub-regions of Washington known as the Coastal Plains and the Coast Range. Narrow, sandy beaches, tidal flats and delta flood plains bordering and extending into Willapa Bay comprise the smaller coastal strip. Long Island in Willapa Bay, the Tokeland peninsula, and Bay Center peninsula are barely above average high-tide. The shallows of Willapa Bay contain many areas suitable for oyster culture.

Flood plains formed by sediments deposited by the Willapa, Naselle, Bear and North Rivers, and Smith Creek extend into the Willapa Bay depression. The estuaries of these rivers are navigable for small vessels. Sand Island is a low plain in the estuary of the Columbia River. Long Beach peninsula, with one of the longest continuous ocean beaches on the Pacific Coast, is the largest district of the Coastal Plains region. Here ocean sands, deposited and blown inland by the prevailing westerlies, have created a peninsula nearly 30 miles long, and from one to three miles wide. The interior of the peninsula contained bogs, shallow ponds, and lakes some of which have been reclaimed and developed for cranberry culture.

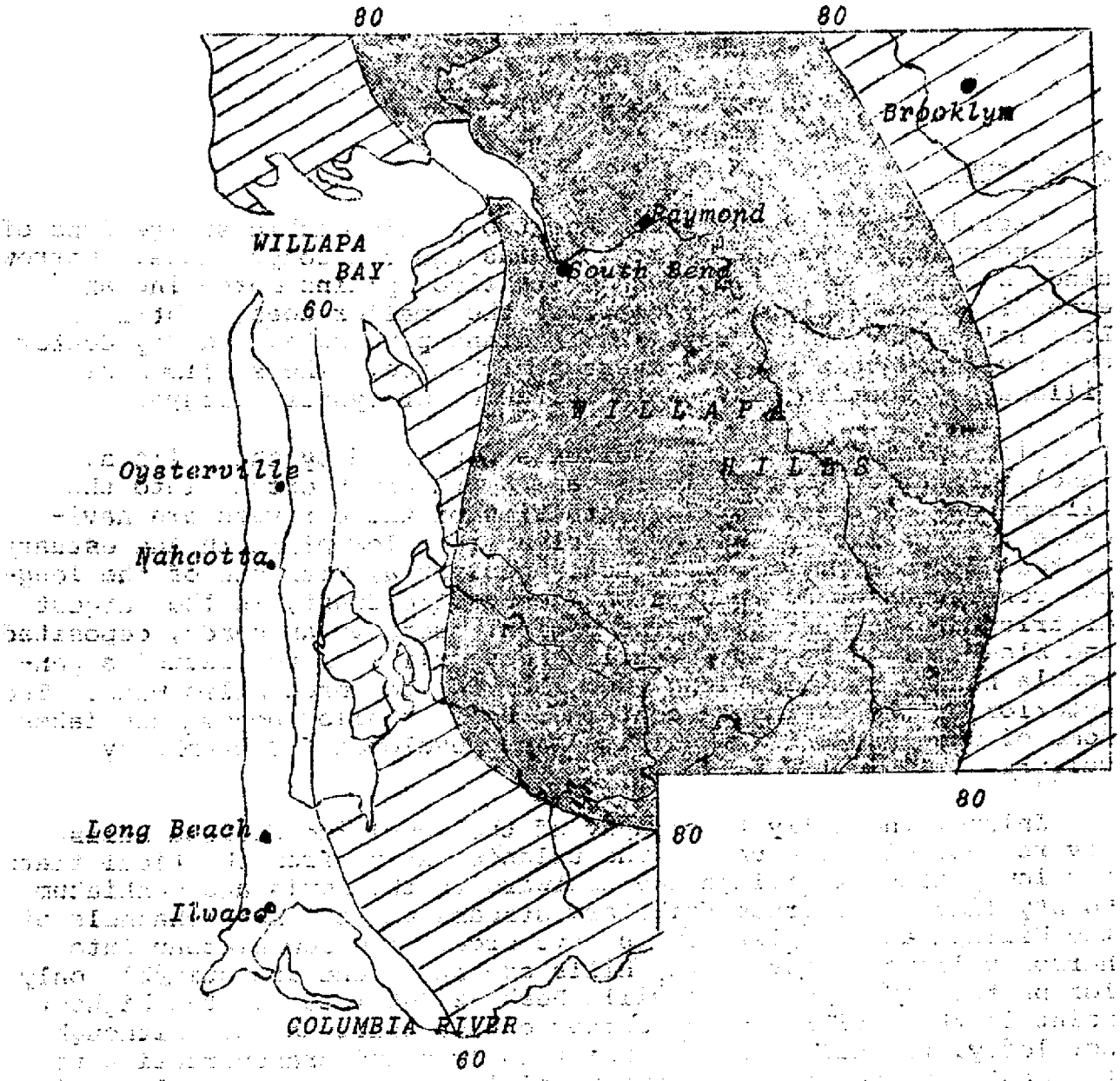
Inland, the hilly topography of the low-lying Willapa Hills covers most of the county. The uplands extend from the tidal flats and low plains of Willapa Bay eastward to the Lewis and Wahkiakum County lines. Numerous tributary streams and the main channels of the Willapa and Naselle Rivers have eroded the low plateau into narrow valleys. Most of the hills are steep and are suitable only for pasture or timber. Walville Peak, 2,400 feet, is the highest point in the Pacific County sector of the Coast Range. Although not lofty, the hills are a barrier to overland transportation to the east, and do limit the amount of land suitable for cultivation.

Climate

Relationship of weather and climate to agriculture is close. The climate of any region accounts for the vegetation native to the region, and is an important factor in what man can grow. Variations in weather may stimulate or destroy crops in the process of development. These and other factors make weather and climate basic to the overall study of agriculture for any given area.

Within the world-wide classification of climate, Pacific County is located in a region classified as West Coast Marine. On the

DISTRIBUTION OF PRECIPITATION - PACIFIC COUNTY



Under 60 inches

60 to 80 inches

Over 80 inches

west coast of the United States this climate-type extends from southeastern Alaska to northern California. It is also found in northwestern Europe, along the coast of southern Chile, and in New Zealand. Forestry and dairying are often found in regions with a west coast marine climate.

Summers in Pacific County are cool and comparatively dry, and the winters mild, wet, and rather cloudy. The air is moist and the daily and annual range in temperature is small. Among the factors influencing the climate are the prevailing directions of the wind, the surface temperature of the ocean, the nearby Coastal and Cascade Mountains, and the position and intensity of the large high and low pressure centers over the Pacific Ocean. The ocean current along the coast reverses direction between summer and winter producing a range of 48° in February and March to 58° in August in the surface temperature of the sea.

Afternoon summer temperatures range in the low 60's. Sunshine and midsummer temperatures are reduced by offshore fog banks which spread up the Columbia estuary and over Willapa Bay. Hot, dry, easterly winds from the interior occasionally cross the Cascades sending the thermometer into the nineties. Then forest fires may start easily and spread quickly.

During the fall and winter the low pressure center near the Aleutian Islands intensifies and spreads southward. At the same time the North Pacific high pressure area grows smaller and moves south. A prevailing flow of warm moist air from the southwest results. An increased number of storms then strike the Washington coast, and the wind velocities ranging from 50 to 70 m.p.h. occur almost every winter as the more intense storms move inland. Winds in excess of 100 m.p.h. have been recorded on one of the higher and exposed peaks of the Willapa Hills.

Winter afternoon temperatures are in the 40's and nighttime temperatures in the upper 30's. The coldest weather usually occurs when cold dry air from east of the Cascades reaches the coast. The sky is frequently clear during these conditions, and additional heat is lost by radiation at night. Minimum temperatures may drop to 20° or lower and maximum temperatures fail to rise above the mid-30's. Cold snaps seldom continue more than a few days before warmer moist air from over the ocean moves in. Snowfall is light in the beach areas. Light frosts may occur in the valley lowlands. In the cranberry bogs near the ocean the average last occurrence of 32° or a freezing temperature in the spring is about the middle of April, and the first freeze in the fall is near the end of October.

Although the county has a relatively long growing season free of frosts, the low rate of sunshine and the general coolness slow crop growth. The growing season averages more than 200 days in the

TABLE 1: FREEZE DATA, SELECTED STATIONS, PACIFIC COUNTY

Subject	Willapa Harbor			North Head		
Freeze threshold temperature	32°	28°	24°	32°	28°	24°
Mean date of last Spring occurrence	04-17	03-14	02-05	02-03	01-22	01-10
Mean date of first Fall occurrence	11-04	11-26	12-21	12-20	12-27	-
Mean number of days between dates	201	257	319	320	339	-
Years of record - Spring	19	19	19	23	23	23
No. of occurrences - Spring	19	19	16	16	14	10
Years of record - Fall	19	19	19	22	22	22
No. of occurrences - Fall	19	16	9	13	4	1

Source: U. S. Department of Commerce, Environmental Data Service

TABLE 2: PROBABILITY OF FREEZING TEMPERATURES, PACIFIC COUNTY 1/

STATION	TEMP (°F)	PROBABILITY - SPRING 90%	75%	50%	25%	10%	PROBABILITY - FALL 10%	25%	50%	75%	90%	Growing Season Mean Length
Willapa Harbor	32	Mar 19	Mar 30	Apr 13	Apr 27	May 9	Oct 16	Oct 27	Nov 8	Nov 20	Dec 1	209 Days
	28	Feb 3	Feb 19	Mar 5	Mar 18	Mar 30	Nov 5	Nov 17	Dec 1	Dec 31	-	271 Days
	24	-	-	Jan 30	Feb 18	Mar 3	Nov 23	Dec 8	-	-	-	335 Days

Source: U. S. Department of Commerce, Environmental Data Service.

1/ To illustrate the data in the table, we find that the 50 percent probability of a 32° spring freeze for Willapa Harbor is April 13. But there is also a 25 percent chance (1 year in 4) that a 32° freeze will occur as late as April 27, and 10 percent chance as late as May 9.

TABLE 3: TEMPERATURES-MEAN DAILY MAXIMUM, MEAN DAILY MINIMUM, MEAN, HIGHEST AND LOWEST, MONTHLY AND ANNUAL, PACIFIC COUNTY

Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl.
		- Degrees Fahrenheit -												
Grayland	Max.	48	50	52	56	60	63	66	67	67	61	54	50	58
(Grays Harbor	Min.	36	37	36	40	44	48	50	50	48	44	39	38	42
County)	Mean	42	44	44	48	52	56	58	58	57	53	47	44	50
Elev. 15 ft.	High	68	67	73	83	84	94	96	90	92	81	68	64	96
	Low	11	17	22	27	27	37	37	37	34	29	12	19	11
Willapa Harbor	Max.	47	50	54	59	64	67	72	72	70	63	54	48	60
Elev. 150 ft.	Min.	34	35	36	39	44	48	51	52	49	44	39	36	42
	Mean	41	43	45	50	54	58	61	62	60	54	46	43	51
	High	70	76	83	90	93	102	103	99	97	89	78	70	103
	Low	13	9	20	22	27	34	36	37	31	19	11	6	6

Source: U. S. Department of Commerce, Environmental Data Service

TABLE 4: TOTAL PRECIPITATION, NORMAL, MONTHLY AND ANNUAL (INCHES) PACIFIC COUNTY

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl.
Willapa Harbor	12.4	10.4	9.9	5.9	3.7	3.2	1.5	1.7	3.6	8.5	11.3	14.6	86.6
Naselle	17.2	14.3	13.6	7.0	4.3	3.6	1.6	2.0	4.6	11.1	15.0	20.1	114.5
Grayland	11.1	9.4	8.3	5.6	3.1	2.7	1.4	2.1	3.3	7.6	10.8	11.1	76.4
Brooklyn	11.1	9.5	8.6	5.1	3.2	2.5	.9	1.4	3.1	7.7	10.2	13.3	76.8
Long Beach	12.1	10.5	8.9	6.4	3.4	3.2	1.4	2.2	3.3	8.1	11.5	11.7	82.8

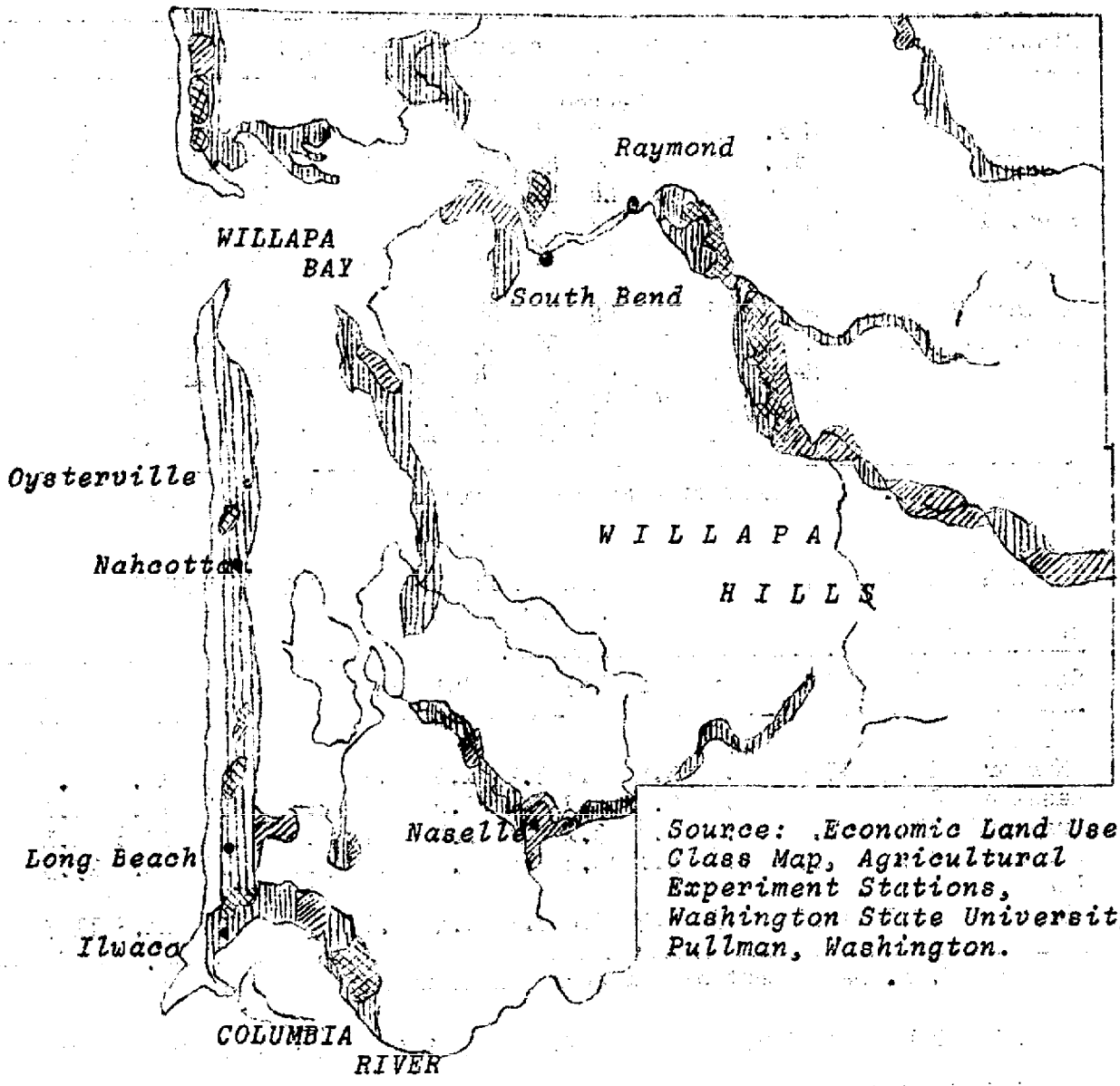
Source: U. S. Department of Commerce, Environmental Data Service

TABLE 5 PRECIPITATION, AVERAGES AND EXTREMES (INCHES), PACIFIC COUNTY

Station	Elev. (ft.)	Period of Record	Average Annual	Greatest Annual	Least Annual	Greatest Monthly	Least Monthly	Greatest Daily
Willapa Harbor	150	1931-60	86.6	117.3	64.7	37.1	.1	5.6
Naselle	35	1931-60	114.5	160.6	78.7	51.4	.04	7.2
Grayland	15	1953-62	76.4	83.5	62.9	19.3	.1	3.5
Long Beach	25	1953-62	82.8	88.3	72.4	22.1	.04	3.3
Brooklyn	190	1931-60	76.8	106.0	48.0	34.4	t	5.3

Source: U. S. Department of Commerce, Environmental Data Service.
t = Trace, too small to measure.

ECONOMIC LAND USE CLASS MAP - PACIFIC COUNTY



Source: Economic Land Use Class Map, Agricultural Experiment Stations, Washington State University, Pullman, Washington.

LAND CLASS 1 & 2

LAND CLASS 4 & 5

LAND CLASS 3

LAND CLASS 6

farmland areas and varies slightly from east to west. Temperature conditions in the western lowlands of the county are good for grass farming and dairying, but only fair for hay or crops which need large amounts of sunshine and warmth to mature.

With spring the prevailing winds gradually shift to the west, to the northwest by early summer, and back to the west again in the early fall. The rainy season then begins and reaches a peak in the winter before decreasing in the spring. Generally, rainfall ranges from 65 to 75 inches in the beach areas, 80 to 90 inches in the foothills, and reaches 100 inches in the Willapa Hills. Rainfall is usually of moderate intensity over a period of 12 to 24 hours, but the intensity rises toward the windward slopes of the Coast Range.

Productivity of Farm Land

Studies made by the Washington Agricultural Experiment Stations show that farm land may be divided into five classes of economic use or productivity based on the capability of full-time farms to produce income and provide for an accumulation of capital over a long period of time. This capability results from differing combinations of physical resources - chiefly soil characteristics, topographic features, and drainage. Technology and accessibility to markets can also operate as decisive factors, however.

The most productive farm land in Pacific County (Class 1 and 2) is located in the Willapa River Valley, in the diked tidal flats along Willapa Bay, the Columbia River flats east of Ilwaco, and the cranberry lands in the Grayland district and on North Beach peninsula. The largest area of Class 2 land lies between Holcomb and Old Willapa in the middle valley of the Willapa. There is a large area just west of Raymond. Class 1 and 2 farmland typically provides the highest net income per farm over a period of years, and yields a high standard of living for the farm family.

Class 3 lands are of average productivity and yield an average level of income by full-time farming. Moderate capital accumulation is possible. This land class is dominant in the Willapa Valley, and particularly in the upper valley in the vicinity of Nallpec, Lebam, and Francis. Here also are found large areas of Class 4 land - an indication of the marginal agricultural capability of parts of this region. Other large areas of Class 3 land lie on the southern shores of the Willapa River estuary, and in the Naselle River Valley.

The lower valley of the Willapa just east and west of Raymond is largely Class 4 land, land that is below average in income-producing potential. This land class is frequently characterized by soil and topographical restrictions. Farms are small and farmers

working Class 4 land generally obtain most of their living from non-farm sources. Other large areas of Class 4 land are found on the lower Long Beach peninsula above Ilwaco and here and there along the upper peninsula.

Class 5 farm land (where net farm incomes are very low) dominates the Long Beach peninsula and the sandy coastal plains. Soils are of low fertility; drainage is poor. Much of the land in the upper elevations of the Naselle, Willapa, and tributary valleys where topography is steep is Class 5 land.

Class 6 land is nonagricultural, and in general is not suitable for development into farming units. The Willapa Hills and the sand and tidal country of the coastal plains covers most of the Pacific County. In the hills, temperature and rainfall are ideal for the large commercial stands of Douglas fir, hemlock and other trees. Where cleared, however, this land may prove suitable for grazing livestock in some cases.

Forests

Pacific County has a combination of physical conditions highly favorable for the growing of timber. Originally, the forest stands covered all but a very small part of the county land area, and were among the heaviest in the Pacific Northwest. However, practically all the original timber was logged by 1950. Today, 539,000 acres or 91 percent of the county area is forested, largely in commercial stands of second and regrowth timber.

The inventory of Pacific County forests taken by the Forest Service in 1963, showed 522,000 acres of commercial timber. The forest industry itself - companies and individuals operating wood-using plants - owned 385,000 acres or 74 percent; 67,000 acres were owned or administered by State, county, and other government bodies (other than National Forests); and 70,000 acres were farmer-owned or otherwise privately held. As of January 1, 1964, there were 2,495,000,000 cubic feet (net) of young growing commercial timber in the county. The sawtimber volume was estimated to total 14,687,000,000 board feet (International rule) or 11,955,000,000 board feet by the commonly used Scribner rule.

Western hemlock is the most important forest species, making up 59 percent of the volume of growing stock and sawtimber on commercial forest land. Douglas fir, Sitka spruce, Western red cedar, and Pacific silver fir are the other softwood species. The chief hardwoods are red alder and bigleaf maple.

TABLE 5: FORESTS OF PACIFIC COUNTY, 1963

Subject	
County land area	592,000 acres
Total forest	539,000 acres
Non-forest	53,000 acres
Commercial forests	522,000 acres
Forest industry	385,000 acres
National Forests	-
Other public	67,000 acres
Farmer & misc. private	70,000 acres
Commercial growing stock	2,495 mil.cu.ft.
Forest industry	1,995 mil.cu.ft.
National Forests	-
Other public	272 mil.cu.ft.
Farmer & misc. private	228 mil.cu.ft.
Commercial saw timber	14,687 mil.bd.ft. 1/
Forest industry	12,306 mil.bd.ft.
National Forests	-
Other public	1,415 mil.bd.ft.
Farmer & misc. private	966 mil.bd.ft.
Commercial growing stock - species	2,495 mil.cu.ft.
Western hemlock	1,461 mil.cu.ft.
Douglas-fir	301 mil.cu.ft.
Sitka spruce	210 mil.cu.ft.
Western red cedar	170 mil.cu.ft.
Pacific silver fir	97 mil.cu.ft.
Red alder	252 mil.cu.ft.
Bigleaf maple	4 mil.cu.ft.
Commercial saw timber - species	14,687 mil.bd.ft. 1/
Western hemlock	8,723 mil.bd.ft.
Douglas-fir	1,861 mil.bd.ft
Sitka spruce	1,424 mil.bd.ft.
Western red cedar	1,180 mil.bd.ft.
Pacific silver fir	566 mil.bd.ft.
Red alder	906 mil.bd.ft.
Bigleaf maple	27 mil.bd.ft.

(continued)

TABLE 5: FORESTS OF PACIFIC COUNTY, 1963 (continued)

Subject	
Commercial saw timber - species	11,955 mil.bd.ft. 2/
Western hemlock	6,891 mil.bd.ft.
Douglas-fir	1,486 mil.bd.ft.
Sitka spruce	1,207 mil.bd.ft.
Western red cedar	1,010 mil.bd.ft.
Pacific silver fir	456 mil.bd.ft.
Red alder	879 mil.bd.ft.
Bigleaf maple	26 mil.bd.ft.

Source: U. S. Forest Service. *1/ International ¼-inch rule - the standard board-foot log rule used by the Forest Service to present volume statistics. 2. Scribner rule - the common board-foot log rule used in the Pacific Northwest.*

Wildlife

Forests, upland lakes and streams, protected inshore waters, tidal flats and seashore provide a varied habitat for many wildlife species. Salt water fishing and clam digging attract people to the Long Beach peninsula and to Ilwaco on the Columbia estuary. Steelhead fishing is a major sport on the Columbia, Grays and Naselle Rivers. Many streams that drain the Willapa Hills offer fine trout fishing. Interior uplands abound with grouse, pheasant, and deer. The Willapa Hills contain one of the largest elk populations in the United States. During the 1966-1967 season 1,370 deer were killed, 1,270 elk, 1,710 pheasants, 30,420 ducks, and 3,900 geese as well as many other game animals and upland and migratory game birds.

The county also has an important wild fur resource. During the 1966-1967 trapping season the total catch (computed) of fur animals in the county was valued at more than $16,500, and included 978 beaver, 1,610 muskrat, 94 mink, 130 raccoon, 92 otter, as well as many other small animals. Beaver pelts represented 70 percent of the total value. Many rural families derive some income from the wildlife resources of the county and the sportsmen and tourists they attract. Services to hunters, fishermen, and others earned $5,950 for only eight farms in 1964, however, according to the Census of Agriculture.